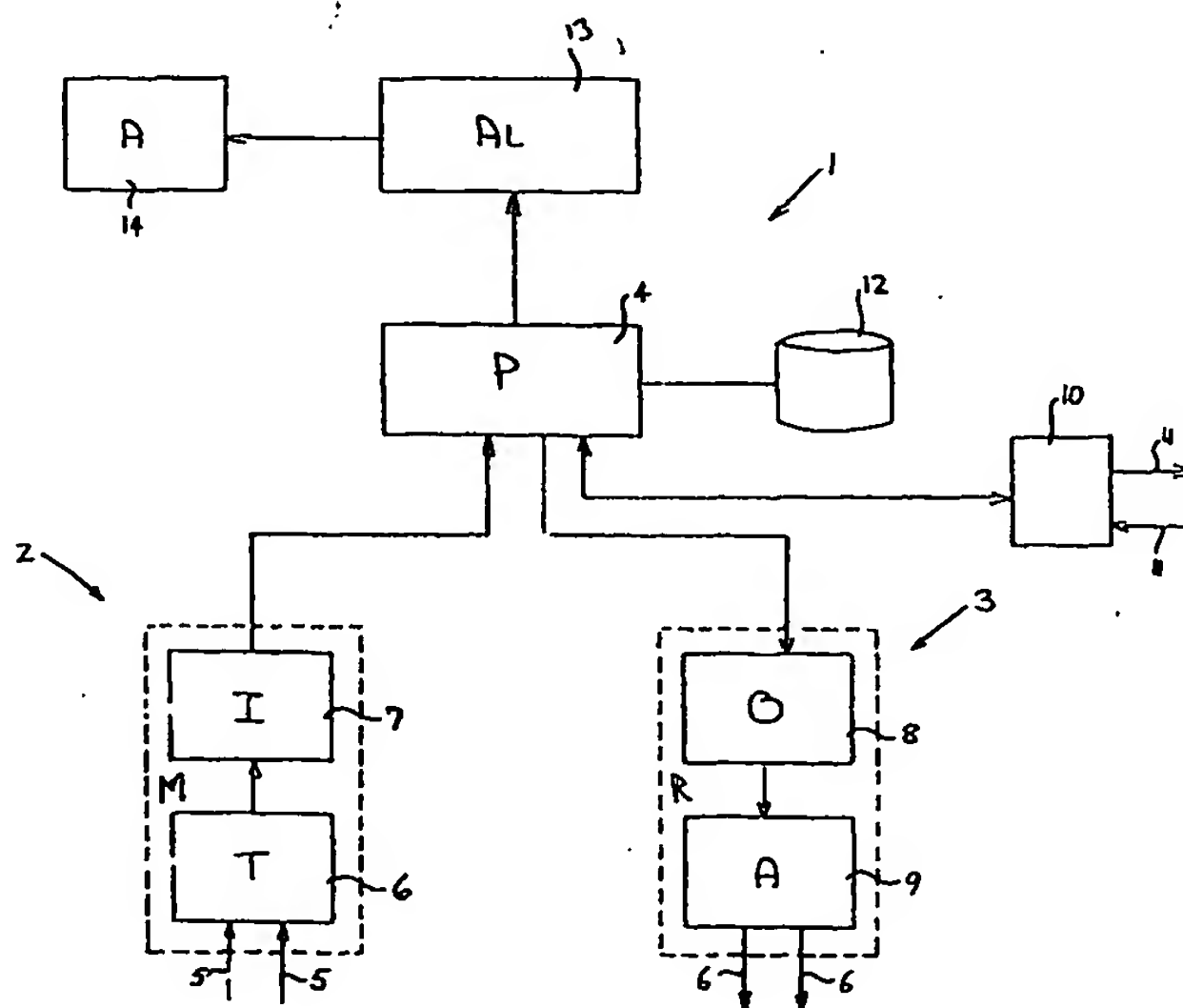




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(54) Title: **VEHICLE MONITORING AND CONTROL**

(57) Abstract

An apparatus for monitoring and controlling a motor vehicle, comprising: a measurement facility secured to the vehicle, the measurement facility being capable of repeatedly measuring, in use, a plurality of motor vehicle operating parameters; a regulation facility secured to the vehicle, the regulation facility being operable to regulate, in use, a number of motor vehicle control parameters; and a processor secured to the vehicle, the processor being arranged to evaluate the measured vehicle operating parameters, and to regulate the motor vehicle control parameters to urge the motor vehicle to a desired performance.

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VEHICLE MONITORING AND CONTROL

FIELD OF THE INVENTION

5 This invention relates to a method and to an apparatus for monitoring and controlling motor vehicles and, more particularly, to an apparatus and to a method for monitoring and controlling motor vehicles in order to minimize misuse and abuse thereof.

BACKGROUND TO THE INVENTION

10 Numerous systems are known in the prior art for monitoring and controlling use of motor vehicles.

15 These systems include the Tachograph which monitors engine speed, road speed and driver stoppage times, and on board computers (OBCs) which also monitor braking performance, driver identity, and the like, in addition to engine speed and road speed.

20 All of these prior art systems record vehicle parameter information which is later downloaded for interpretation and analysis, leading to considerable delays before errant drivers can be disciplined.

Mechanical or electromechanical speed-limiting devices are employed to enforce traffic regulations.

It is also known to monitor fuel consumption by means of flow meter systems. Such systems merely calculate average fuel consumption and cannot detect pilferage of fuel, due to their limited accuracy.

5 Numerous engine protection units (EPUs) are currently known. Such systems generally monitor various engine temperatures, oil pressure and coolant level.

Tracking systems have also become common in various high crime jurisdictions. Such tracking systems rely on the use of a single communication network such
10 as a land mobile radio network, a trunk radio network, a cellular telephony network or a global positioning system.

All of the monitoring and control devices outlined above have various advantages and disadvantages, and a user of such Tachographs, OBCs, speed limiters, fuel
15 monitoring systems, EPUs and tracking systems, is generally faced with a variety of diverse sub-systems which are not inter-operable.

OBJECT OF THE INVENTION

20 It is the object of this invention to provide a vehicle monitoring and control system which will facilitate integrated monitoring and control of various operating parameters of a motor vehicle.

SUMMARY OF THE INVENTION

In accordance with this invention there is provided an apparatus for monitoring and controlling a motor vehicle, comprising:
a measurement facility secured to the vehicle, the measurement facility being
30 capable of repeatedly measuring, in use, a plurality of motor vehicle operating parameters;
a regulation facility secured to the vehicle, the regulation facility being operable to regulate, in use, a number of motor vehicle control parameters; and
a processor secured to the vehicle, the processor being arranged to evaluate the
35 measured vehicle operating parameters, and to regulate the motor vehicle control parameters to urge the motor vehicle to a desired performance.

Further features of the invention provide for the apparatus to include a storage means for recording the plurality of measured operating parameters for a predetermined time period, for the apparatus to include an alarm facility, the alarm facility being arranged to compare each one of the plurality of measured operating parameters against a corresponding upper and a corresponding lower threshold, for the apparatus to also include an annunciator operable by the alarm facility to alert a driver of the motor vehicle when any one of the measured operating parameters exceeds its corresponding upper alarm threshold or is less than its corresponding lower alarm threshold, for the annunciator to be an audible annunciator, and for the audible annunciator to be a voice synthesizer.

Still further features of the invention provide for the motor vehicle operating parameters to be selectable from a list including engine speed, motor vehicle road speed, fuel consumption, engine temperature, engine oil pressure, oil level water level and motor vehicle geographical location, and for the motor vehicle control parameters to be selectable from a list including engine fuel flow and motor vehicle ignition.

Yet further features of the invention provide for the measurement facility to include an input interface connectable to a plurality of transducers for measuring the plurality of motor vehicle operating parameters, for the input interface to include any one or more of analogue, digital or clock inputs, for the regulation facility to include an output interface connectable to a number of actuators for regulating the motor vehicle control parameters, for the output interface to include any one or more of pulse-width-modulated, analogue or digital outputs, for the apparatus to also include a communication interface, and for the communication interface to include a radio frequency and an RS232C serial communication port.

The invention extends to a method for monitoring and controlling a motor vehicle, comprising the steps of:
repeatedly measuring a plurality of motor vehicle operation parameters by means of a measurement facility secured to the motor vehicle;
evaluating the measured vehicle operating parameters by means of a processor secured to the vehicle; and
regulating a number of motor vehicle control parameters by means of a regulation facility secured to the vehicle to urge the motor vehicle to a desired performance.

There is provided for the method to include the further step of recording the plurality of measured operating parameters for a predetermined time period, for the method to also include the steps of:

- 5 comparing each one of the plurality of measured operating parameters against a corresponding upper and a corresponding lower threshold; and
alerting a driver of the motor vehicle when any one of the measured operating parameters exceeds its corresponding upper alarm threshold or is less than its corresponding lower alarm threshold.

10 **BRIEF DESCRIPTION OF THE DRAWINGS**

One embodiment of the invention is described below, by way of example only, and with reference to the accompanying drawings in which:

- 15 FIG.1 is a diagrammatic view of an apparatus for monitoring and controlling a vehicle according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

- 20 Referring to Figure 1 an apparatus for monitoring and controlling a motor vehicle is indicated generally by reference numeral (1).

- 25 The apparatus (1) includes a measurement facility indicated generally by reference numeral (2) and, a regulation facility indicated generally by reference numeral (3) and a processor (4).

The measurement facility (2), the regulation facility (3) and the process (4) are secured to the motor vehicle (not shown).

- 30 The measurement facility (2) is capable of repeatedly measuring, in use, a plurality of operating parameters (5) of the motor vehicle. The measurement facility (2) comprises a plurality of transducers (6) for measuring the motor vehicle operating parameters (5), and an input interface (7) connecting the transducers (6) to the processor (4). The input interface (6) includes any one or
35 more of analogue, digital or clock inputs, while the motor vehicle operating parameters (5) are selected from a non-exhaustive list including engine speed,

motor vehicle road speed, fuel consumption, engine temperature, engine oil pressure, oil level, water level and motor vehicle geographical location.

5 The regulation facility (3) is operable to regulate, in use, a number of motor vehicle control parameters (6). The regulation facility (3) includes an output interface (8) connectable to a number of actuators (9) for regulating the motor vehicle control parameters (6). The output interface (8) includes any one or more of pulse width modulated analogue or digital outputs and the motor vehicle control parameters are selectable from a non-exhaustive list including engine fuel
10 flow and motor vehicle ignition.

The apparatus (1) also includes a communication interface (10) connected to the processor (4) which provides a bi-directional radio frequency or RS232 serial communication port (11).
15

The apparatus (1) also includes a storage means (12) in the form of random access memory for recording the plurality of measured operating parameters (5) of the motor vehicle over a predetermined time period. Further, the apparatus (1) also includes an alarm facility (13) arranged to compare each one of the plurality
20 of measured operating parameters (5) against a corresponding upper and a corresponding lower threshold which are stored in the storage means (12). The alarm facility (13) is connected to operate and audible annunciator (14) in the form of a voice synthesiser.

25 In use, the processor (4) repeatedly evaluates the vehicle operating parameters (5) measured by the measuring facility (2) against a desired performance of the motor vehicle (not shown) and regulates to motor vehicle control parameters (6) by means of the regulation facility (3) in order to urge the motor vehicle (not shown) to the desired performance.
30

The measured motor vehicle operating parameters (5) are recorded in the storage means (12), thus building up a historical log of the performance of the motor vehicle. The historical log may be conveniently downloaded to a management facility for later analysis and examination. It will be appreciated that
35 the size of the storage facility (12) determines the period over which the measured operating parameters (5) can be stored.

The alarm facility (13) compares each one of the measured operating parameters (5) against its corresponding upper and corresponding lower thresholds and activates the voice synthesizer (14) to alert a driver of the motor vehicle (not shown) that one or more of the operating parameters is in an alarm condition.

- 5 Configuration parameters such as, for example, the upper and lower alarm thresholds of the measured operating variables (5) can be set or altered by means of the communication facility (10) when the motor vehicle (not shown) is in a maintenance mode.
- 10 It will be further appreciated by those skilled in the art that the apparatus (1) provides a vehicle monitoring and control system which facilitates integrated monitoring and control of various operating parameters of a motor vehicle.
- 15 Numerous modifications are possible to this embodiment without departing from the scope of the invention. In particular, the processor (4) can be programmed to perform complex control of the motor vehicle operating parameters (5). Further, additional transducers (6) and actuators (9) may be connected to the apparatus (1) to suit the needs of a particular application. Finally, the voice synthesizer (14) may be supplemented by means of visual annunciation in the
- 20 form of digital or analogue gauges and the like.

The invention therefore provides a compact vehicle monitoring and control system which is suitable for autonomous vehicle-borne application.

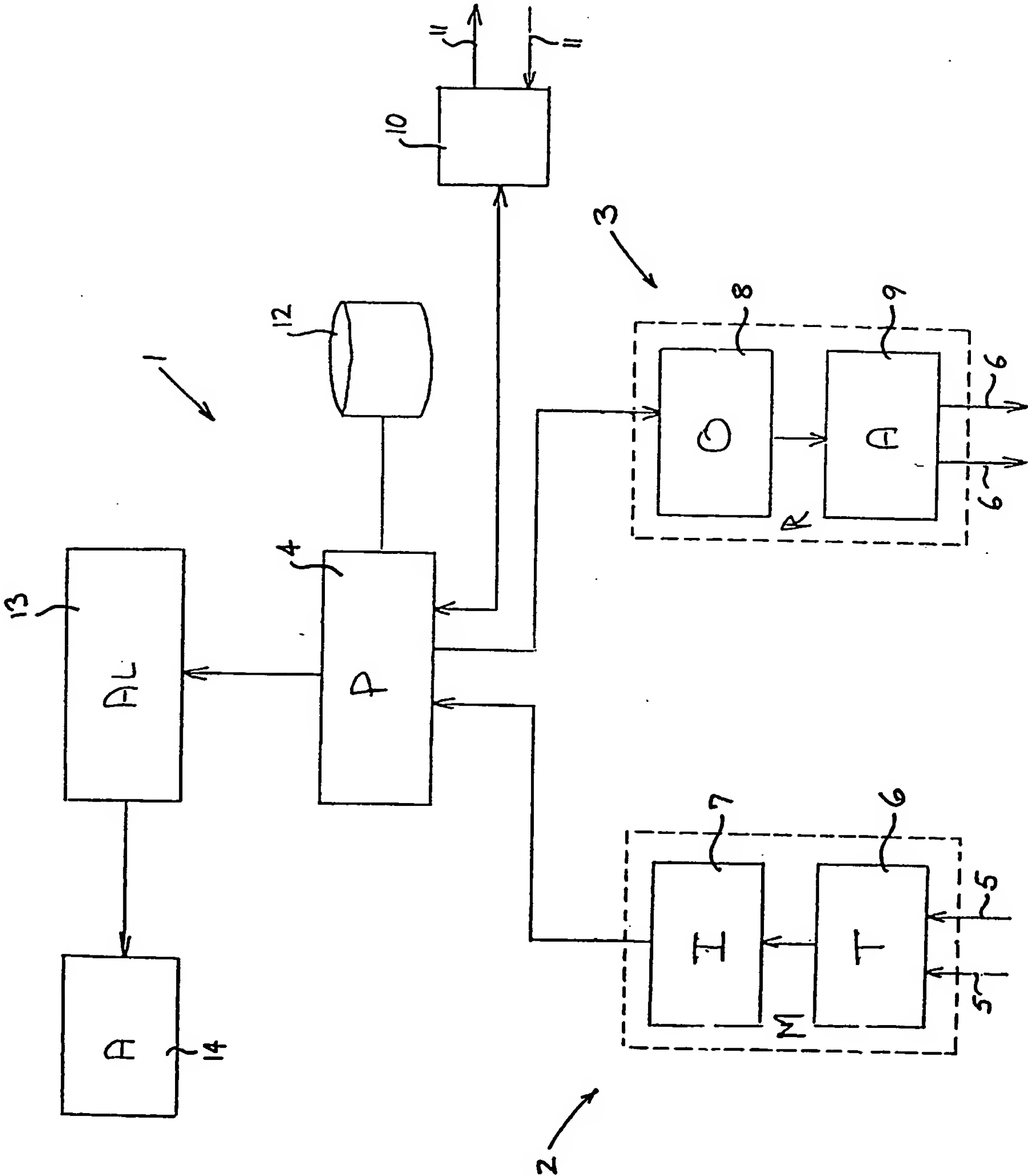
CLAIMS

1. An apparatus for monitoring and controlling a motor vehicle, comprising:
5 a measurement facility secured to the vehicle, the measurement facility
being capable of repeatedly measuring, in use, a plurality of motor vehicle
operating parameters;
a regulation facility secured to the vehicle, the regulation facility being
operable to regulate, in use, a number of motor vehicle control parameters;
and
10 a processor secured to the vehicle, the processor being arranged to
evaluate the measured vehicle operating parameters, and to regulate the
motor vehicle control parameters to urge the motor vehicle to a desired
performance.
- 15 2. An apparatus as claimed in claim 1 which includes a storage means for
recording the plurality of measured operating parameters for a
predetermined time period.
- 20 3. An apparatus as claimed in claim 1 which includes an alarm facility, the
alarm facility being arranged to compare each one of the plurality of
measured operating parameters against a corresponding upper and a
corresponding lower threshold.
- 25 4. An apparatus as claimed in either one of claims 1 or 2 which includes an
annunciator operable by the alarm facility to alert a driver of the motor
vehicle when any one of the measured operating parameters exceeds its
corresponding upper alarm threshold or is less than its corresponding
lower alarm threshold.
- 25 5. An apparatus as claimed in claim 3 in which the annunciator is an audible
annunciator.
6. An apparatus as claimed in claim 5 in which the audible annunciator is a
voice synthesizer.
- 30 7. An apparatus as claimed in any one of the preceding claims in which the
motor vehicle operating parameters are selectable from a list including

engine speed, motor vehicle road speed, fuel consumption, engine temperature, engine oil pressure, oil level water level and motor vehicle geographical location.

- 5 8. An apparatus as claimed in any one of the preceding claims in which the motor vehicle control parameters are selectable from a list including engine fuel flow and motor vehicle ignition.
- 10 9. An apparatus as claimed in any one of the preceding claims in which the measurement facility includes an input interface connectable to a plurality of transducers for measuring the plurality of motor vehicle operating parameters.
- 15 10. An apparatus as claimed in claim 10 in which the input interface includes any one or more of analogue, digital or clock inputs.
- 20 11. An apparatus as claimed in any one of the preceding claims in which the regulation facility includes an output interface connectable to a number of actuators for regulating the motor vehicle control parameters.
- 25 12. An apparatus as claimed in claim 11 in which, the output interface includes any one or more of pulse-width-modulated, analogue or digital outputs.
- 30 13 An apparatus as claimed in any one of the preceding claims which includes a communication interface.
- 35 14. An apparatus as claimed in claim 13 in which the communication interface includes a radio frequency and an RS232C serial communication port.
15. A method for monitoring and controlling a motor vehicle, comprising the steps of:
repeatedly measuring a plurality of motor vehicle operation parameters by means of a measurement facility secured to the motor vehicle;
evaluating the measured vehicle operating parameters by means of a processor secured to the vehicle; and
regulating a number of motor vehicle control parameters by means of a regulation facility secured to the vehicle to urge the motor vehicle to a desired performance.

16. An apparatus as claimed in claim 3 which includes the further step of recording the plurality of measured operating parameters for a predetermined time period.
- 5 17. An apparatus as claimed in either one of claims 15 or 16 which includes the steps of:
comparing each one of the plurality of measured operating parameters against a corresponding upper and a corresponding lower threshold; and
10 alerting a driver of the motor vehicle when any one of the measured operating parameters exceeds its corresponding upper alarm threshold or is less than its corresponding lower alarm threshold.
- 15 18. An apparatus for monitoring and controlling a motor vehicle, substantially as herein described with reference to and as illustrated in the accompanying drawings.
19. A method for monitoring and controlling a motor vehicle, substantially as herein described with reference to the accompanying drawings.



INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/ZA 00/00061

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B60R16/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, WPI Data, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 600 558 A (SCHUMACHER GREG A ET AL) 4 February 1997 (1997-02-04) the whole document	1-19
X	WO 93 04353 A (CRANE HAROLD E) 4 March 1993 (1993-03-04)	1-5, 7-13, 15-19
Y	page 6, line 23 -page 8, line 14 page 8, line 34 -page 13, line 8 page 15, line 17 -page 16, line 34; figures 1-5	6,14
Y	US 5 661 651 A (DYKEMA KURT A ET AL) 26 August 1997 (1997-08-26) column 1, line 51 -column 2, line 23 column 3, line 8 - line 30 column 7, line 19 -column 9, line 10; figures 1-12	6,14

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Y	WO 92 04693 A (CATERPILLAR INC) 19 March 1992 (1992-03-19) page 1, line 12 -page 2, line 3 page 3, line 3 - line 24 page 3, line 30 -page 5, line 10 page 5, line 21 -page 8, line 35 page 16, line 4 -page 18, line 35; figures 1-3B	1-4, 7-11, 15-19
Y	DE 42 23 253 A (BOSCH GMBH ROBERT) 20 January 1994 (1994-01-20) column 2, line 42 - line 67 column 2, line 49 -column 4, line 18 column 4, line 64 -column 6, line 49; figures 1,2	1-4, 7-11, 15-19
A	US 5 283 548 A (KANNO ISAO) 1 February 1994 (1994-02-01) the whole document	8

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Information on patent family members

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